surfaces of two abutting wall elements. The *Schubert* reference is also quoted to show wall elements made of solid plates arranged interchangeably in a block as a virtual right parallelepiped wherein the slot-shaped reaction spaces are able to have reactants A and B supplied from the same side of the block and wherein the reaction spaces are oriented to guide the reaction mixture C through the reaction spaces in the same direction and in parallel flows.

However, applicants submit that the description in col. 3 of *Schubert* fails to show a number of important features of the apparatus of the invention.

First, *Schubert* fails to show slot shaped reaction spaces, and submit that the allegation in the Official Action that the partial mixing chambers are "slot shaped" is not well founded. Figs. 3a and 3b are schematic drawings of the device as disclosed in *Schubert,* and the device in Fig. 3a is a schematic representation of the flow guide structure shown in detail in Figs. 1a to 1d.

The foils 1 and 2 shown in Figs. 1a to 1d comprise parallel grooves 3 and 4 and are represented in Fig 3a by two horizontal parallel solid lines and a third dashed line parallel to and closely above the bottom solid line, thereby depicting the groove bottoms as shown for example in Fig. 1a as 4b and 5b.

In Fig. 3b, the elements of the guide structure 13 between the distance foils 14 are depicted in the same manner.

However, it is to be noted that the dashed lines shown near the bottom of elements 12a in Fig. 3b clearly indicate that these elements must have the same structure as the foils with the grooves as the similarly depicted elements 13a and 13b; the only difference being having twice the foil thickness. Accordingly, the allegations in the Official Action that features 12a of Fig. 3b

are slot-shaped spaces between foil elements 12b is in clear contradiction to the disclosure of Fig. 3b of the reference.

The Office Action takes the position that the word "slot" has to be construed by the definition given in a dictionary to follow the US-PTO policy to give the words of the claim their ordinary and customary meaning. While this is correct in general, it is not correct where the application clearly indicates an express intent of the applicants to impart a particular meaning to a claim term. Such an express intent is clearly present in the description of this application in using the term "slot-shaped reaction space" to distinguish the reaction spaces of the invention from reaction spaces in the form of channels known from the prior art, which are formed by directly contacting two plates, of which at least one has grooves cut into the plate surface, see page 4, line 20 to page 5, line 9 of the description.

A skilled person, bearing in mind the intended distinction between the slot-shaped reaction spaces between two plates of the invention and reaction channels known from the prior art, will understand the term "each of said slot-shaped reaction spaces being formed between lateral surfaces of two abutting substantially equally large and substantially right-parallelipedal wall elements" as referring to a space formed between the surfaces of two wall elements which are not in direct contact with each other, excluding embodiments where reaction channels are formed by directly contacting plates which have grooves cut into the surfaces of the places. Therefore, a skilled person will understand the term "wherein the slot-shaped reaction spaces have a slot width of between 0.05 and 5 mm" as referring to the distance between the surfaces of the wall elements and not as referring to the width of a groove formed within one of the surfaces. As a consequence, this feature clearly excludes all embodiments where the surfaces of two

abutting wall elements are in direct contact with each other. Reference is made to Fig. 4 and page 15, lines 7 to 9, which clearly point out that the slot width "s" of the reaction space 3 refers to the distance between the surfaces of the wall elements 1.

Schubert only disclose devices made by stacking foils and joining them (see col. 3, lines 9 to 13). There is no disclosure of a device with a reaction space formed between the surfaces of two wall elements, where the surfaces are kept at a distance of 0.05 to 5mm.

Applicants further wish to comment that the claimed apparatus would not be obvious over *Schubert.* The apparatus disclosed in *Schubert* is assembled from foils with grooves cut into the surface of such foils. A skilled person in the art with the knowledge of the apparatus of Fig. 3b would only arrive at an apparatus as claimed in the application if he would replace the foils 12b with grooves cut into the surface by foils having tubular cavities inside the foil and at the same time, omitting the foils 12a. However, *Schubert* gives not indication of how to make a foil 100 μm thick having tubular cavities inside the foil and the use of such foils is not common practice for the person skilled in this technology. Instead, a skilled person in this art would not consider to omit the foils 12a and arrange foils 12b with no support above and below because he would not expect such an arrangement to be pressure tight as required by the teachings of *Schubert.* Therefore, the claimed apparatus in this case is not an obvious variation in view of the apparatus of *Schubert* and none of the cited documents suggest the modification to arrive at the claimed subject matter.

Therefore, *Schubert* does not anticipate the claimed subject matter.

Moreover, *Schubert* does not disclose a device wherein wall elements are arranged interchangeably. Thus, there is no indication in the reference that the foils of the disclosed

device may be interchanged and the only disclosure on how the foils are joined in col. 3, lines 9-13, refers to diffusion welding which inevitably leads to a device where the foils cannot be interchanged.

It is important to note the word "interchangeably" has not been properly construed. In the phrase "wherein the wall elements are arranged interchangeably in a block", the adverb "interchangeably" clearly refers to the property of the block. And so the claim means that wall elements can actually be removed from such block and be replaced by other elements. This feature is clearly beyond the reach of *Schubert.*

Consequently, applicants respectfully submit that *Schubert* does not describe the claimed apparatus within the meaning of the word "described" in 35 U.S.C. 102.

The rejection of Claims 26-32 under 35 U.S.C. § 103(a) as unpatentable over *Schubert* taken with *Stancliffe et al.,* US 1,622,870, (*Stancliffe*) is traversed and reconsideration is requested.

Combining *Schubert* with *Stancliffe* does not provide a skilled person with any motivation to arrange plates at a distance of 0.05 to 5mm, as *Stancliffe* is related only to device where plates are stacked in direct contact to each other.

Schubert does not disclose devices, where wall elements of a block are arranged interchangeably in a block, because welding foils to form a block inevitably has the consequence that foils cannot be interchanged once they have been welded together. Thus, the rejection which relies on *Schubert* as the principal teaching of the features of the invention is flawed because it does not show the slot shaped reaction spaces between lateral spaced apart

interchangeable wall elements. Neither does *Stancliffe* provide any suggestion that there is an advantage or benefit to be obtained therefrom.

Therefore, the necessary motivation to combine references is missing from the combination of references relied on in the Office Action.

The rejection of Claims 33, 35 and 36 under 35 U.S.C. § 103(a) as unpatenable over *Schubert* is traversed and reconsideration is respectfully requested.

Claims 33, 35 and 36 all depend directly or indirectly in Claim 17 and include all the features of that claim. All arguments previously made apply here as well and will not be repeated to avoid redundancy. Withdrawal of the rejection is respectfully requested.

The rejection of Claims 17-20, 23-32 and 36 under 35 U.S.C. § 103(a) in view of *Ashmead, et al.,* U.S. 5, 690,763, (*Ashmead*) is traversed and reconsideration is respectfully requested.

The Office Action summarizes the *Ashmead* reference and then admits that the reference is silent as to the right parallelepiped wall elements and tubular shaped heat exchanger cavities. Nevertheless, the Office Action concludes that it would have been obvious to a person having ordinary skill in the art to "select such geometries for the wall elements and heat exchanger cavities in the apparatus of *Ashmead,* on the basis of stability of the intended use, because changes in shape would merely involve ordinary skill in the art".

In response, applicants note that the Official Action does not appear to have considered the relationships between the features of the claimed apparatus when assessing the differences between the claimed apparatus and the devices disclosed by *Ashmead.* Thus, the slot-shaped reaction space formed between lateral surfaces of two abutting and substantially right

parallelepipedal wall elements will necessarily be planar with a substantially constant width and extend across essentially the whole area of the wall element surface because the lateral surface of the right parallelepipedal element is by definition substantially flat.

In the device shown by *Ashmead*, the laminae 1000 to 1100 are in direct contact with each other thereby leaving no space between the lateral surfaces of the laminae except for the portions of the surfaces that have been deepened by grooves or other recesses. This direct contact between laminae is necessary for the device to be operable by conducting reactants and products to and from laminae through ports 20, 24 and 34 of the device. The reactor channels 90-1' to 90-8' cited by the Examiner are fundamentally different from the slot-shaped reaction spaces of the application in that the lateral surfaces of laminae 1000 and 1100 shown in Fig. 16 of the reference are in direct contact with each other. This leaves no space in between except for the recesses formed by the grooves in the surface of laminae 1000 and 1100. Consequently, the reactor channels 90-1' to 90-8' are confined to the areas of such recesses whereas the reaction space of the claimed invention extends across the full area of the lateral surfaces forming the reaction space.

The heat exchanger assembly as shown in Figs. 10, 13 and 14 of *Ashmead* cited in the Official Action do not comprise wall elements with tubular cavities for conducting a fluid exchange medium reaching through a wall element. In the assembly of Fig. 10, the heat exchanging fluid enters through the inlet port 75 and leaves through outlet port 76. This is described in col. 12, lines 3-5, of the reference. The fluid is not passed through any tubular cavity reaching through the wall elements 500 or 600. All the cavities reaching through the wall elements are necessary for passing through reactants or reaction products and the device would

not fulfill the intended purpose if heat-exchanging fluid would be passed through one of these cavities. The same holds for the cavities of the wall elements 800, 900 and 1000, which form the heat exchanger assemblies of Figs. 13 and 14.

It is noted that the Official Action that a person of ordinary skill in the art would consider the geometry of the reaction spaces formed in the claimed apparatus as being suitable for the intended use of the apparatus of *Ashmead*. Applicants respectfully submit that this allegation is in clear contradiction to the teachings of the reference. Indeed, *Ashmead* explicitly teaches that the apparatus requires a tortuous channel for passing the reactants through to fulfill its purpose. It is noted that the Examiner has cited that teaching in the Official Action.

However, a skilled person would not consider the flat reaction spaces of uniform distance formed between wall elements of the claimed apparatus to be tortuous channels and, therefore, would not consider to use such a geometry for reaction spaces based on the teaching of *Ashmead*.

With respect to *Ashmead,* this reference only discloses devices where the laminae are stocked in direct content with each other, see Figs. 1, 4 and 5. This also holds true for laminae 1000 and 1100 shown in Fig. 16, referred to in the Office Action. *Ashmead* does not disclose slot-shaped reaction spaces formed between lateral surfaces of two wall elements which have a slot width of from 0.005 to 5 mm formed between the wall elements.

The claims of this application clearly specify that the slot-shaped reaction spaces are arranged for passing reactants and reaction mixture through the said reaction spaces. Also, the tubular cavities are arranged for conducting a heat-exchange medium therethrough, i.e., the reaction space and the tubular cavities are intended for different media. There is nothing in the claims or the specification of the application to indicate that the reaction mixture can be used as

heat-exchange medium and therefore, a skilled person has no reason to interpret the claims in the sense that the reaction mixture and the heat-exchange medium shall be the same medium. The Office Action contains no reason why the use of reaction mixture as a heat-exchange medium shall be the intended purpose of the claimed apparatus. The citation of parts of the description of *Ashmead* out of context cannot be a substitute for such reasoning.

The only part of the *Ashmead* device that corresponds to the cavities for conducting a heat-exchange medium therethrough is the combination of laminae 500 and 600. This part of the device is separated from the laminae 1000 and 1100, forming the reaction channels cited by the Examiner, by a thermal insulation barrier formed between laminae 700 and 800 as described in col. 12, lines 18 to 32 of *Ashmead.* Therefore, the device of *Ashmead* does not comprise wall elements forming a reaction space in between two wall elements and at the same time providing cavities within these wall elements for passing a heat-exchange fluid therethrough. These distinction cannot be ignored. Similarly, features of the prior art cannot be cited in isolation without considering the relationship between them as described in the prior art.

The allegation of the Examiner, that the claimed apparatus differs from the *Ashmead* apparatus merely by geometries is not well considered. The disclosure of *Ashmead* that the size and shape of reaction channels and the number and geometry of the laminae can be changed, provides no guidance as to why these geometries should be changed and how to vary these features, *i.e.* to increase or decrease. *Ashmead* fails to lead a skilled person to a device, where the wall elements forming the reaction space comprise cavities. Nothing of the sort is shown or suggested by *Ashmead.* Accordingly, withdrawal of the rejection is respectfully requested.

The rejection of Claims 17, 19, 21, 23 and 33 as unpatentable under 35 U.S.C. § 103(a) in view of *Vu, et al.,* US 4,820,495 (*Vu*) taken with *Alagy, et al.,* US 4,973,977 (*Alagy*) is traversed and reconsideration is respectfully requested.

Vu is summarized in the Official Action as showing a reactor in which there are located a plurality of wall elements, a plurality of slot-shaped reaction spaces and a plurality of cavities for conducting therethrough a heat exchange medium. The slot-shaped reaction spaces are said to be able to have the reactants supplied from the same side of the block and being oriented to guide the reaction mixture through the reaction spaces in the same direction and in parallel flows.

Alagy is relied on in the Office Action to show slot width of various dimension.

With respect to *Vu* it is correct that *Vu* does not disclose the width of the reaction space between the plates 9. The Office Action then alleges that it would have been obvious for a skilled person to select a width within the claimed range based on the suitability for the intended use. However, the Office Action provides no arguments on why a width of the reaction space in the range of 0.05 to 5 mm should be suitable for the use intended in *Vu* other then alleging that changes in size are within the skill of the art. The reference contains no disclosure as far as the distance is concerned between the heat exchange plates 9 or 31 and provides no guidance to a person skilled in the art on how to selected such distances. The reference also does not give any indication that the distance between the plates 9 or 31 may have any effect on the spreading of flames in the slot formed between the two plates.

However, the apparatus of *Vu* is intended to be used for reactions under high pressure with a heterogeneous catalyst, which is packed within the reaction spaces. The reactor is also intended for use at high gas velocities of 1 to 200 meters per second, see col. 4, lines 31 to 33. It

is common knowledge in the fields of chemical engineering that packings of small catalyst particles will lead to an increased pressure drop in the catalyst bed, in particular at high gas flow rates. This leads to an increased energy consumption and therefore, a skilled person will avoid catalyst particles that are smaller than necessary. It is also common knowledge that it is difficult to fill slot-shaped spaces with a width of 5mm or less with catalyst particles of the common size used in the reactions of *Vu.* Therefore a person skilled in the art would have had no motivation to select a reaction space width within the claimed range for the intended purpose disclosed in *Vu* in the absence of any further guidance.

The only indication of the width of reaction spaces between the heat-exchange plates in *Vu* is given in Fig. 4 and 4a, which show the reaction space width between the heat-exchange plates to be substantially larger than the thickness of the heat-exchange plates themselves. This also would not motivate a skilled person to select a slot width of 5 mm or less, based on the usual thickness of metal sheets used for constructing heat exchangers of the size intended in *Vu* i.e., up to 10 meters in length, see col. 2, lines 59 to 66.

With respect to the combination of *Vu* and *Alagy* it is to be noted that *Alagy* is directed to reactions carried out at ambient pressure and high temperatures in empty reaction channels in the absence of any catalyst. Therefore, *Alagy* cannot give a skilled person any guidance on how to select the width of a reaction space filled with a heterogeneous catalyst in the apparatus of *Vu.*

As a general observation, many arguments contained in the Final Action are made in hindsight, based on the teachings of the application, without providing reasons for why a skilled person would combine particular features or documents based on what is taught in the prior art or what are the uses intended in the prior art. Picking and choosing features from the prior art in

isolation without considering obvious functional relationships between the features and the teachings of the reference as a whole is not the proper test of obviousness.

In view of the foregoing, applicants respectfully request reconsideration and favorable action at the Examiner's earliest convenience.

Respectfully submitted,

SMITH, GAMBRELL & RUSSELL, LLP

By:

Robert G. Weilacher, Reg. No. 20,531

Suite 3100, Promenade II
1230 Peachtree Street, N.E.
Atlanta, Georgia 30309-3592
Telephone: (404) 815-3593
Facsimile: (404) 685-6893